2nd Annual GSFC-JPL Quality Mission Software Workshop

Goddard Space Flight Center
Jet Propulsion Laboratory

Session 1: Software Practitioner Concerns

San Diego, California
May 16-18, 2000

AGENDA
Session 1: Software Practitioner Concerns

Day 1
Tuesday – May 16, 2000

8:30 am	Opening Remarks	R. Doyle/M. Szczur

Software Practitioner Concerns

8:50 am	CSMISS Workforce Enrichment Element	T. Jansma
9:20 am	GSFC AETD/STAAC Career Development Working Group	S. Green
9:40 am	NASA Software Working Group Training Subcommittee	J. Kelly
10:00 am	NASA IT Workforce Challenge Team	T. Jansma
10:20 am	Break	
10:35 am	Working Session	All
Noon	Lunch	

Software Practitioner Concerns

Center for Space Mission Information and Software Systems (CSMISS) IT Workforce Enrichment Element

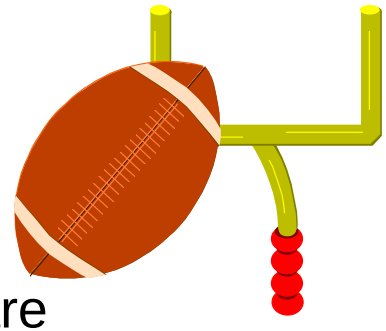
JPL

P. A. "Trisha" Jansma

May 16, 2000

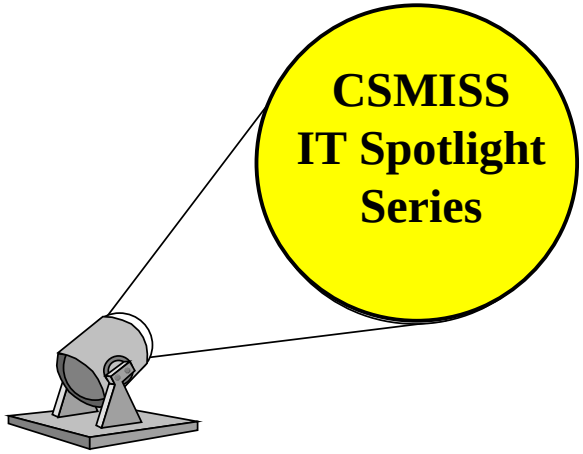
CSMISS Overview

- The Center for Space Mission Information and Software Systems (CSMISS) is an internal Center of Excellence for Information Technology (IT) at JPL.
- The goals of CSMISS are twofold:
  - Be the JPL Center of Excellence for providing information and software systems best practices and technologies to support missions in concurrent software development with reduced cost and improved quality and reuse.
  - Provide the voice and ongoing skills training for the JPL IT community so that the Laboratory recruits and retains a world-class IT workforce.
- CSMISS consists of four work areas:
  - Mission Software Process (MSP), Software Engineering Technology (SET), IT Workforce Enrichment (IT/WE), External Liaison Program (ELP)



Objectives of CSMISS IT Workforce Enrichment Element

- **Build a sense of community** among IT Professionals at JPL.
  - **Establish IT Community mailing lists and Web sites.**
  - Provide a forum for sharing/exchanging technical ideas and breakthroughs.
    - Sponsor the IT Seminar Series highlighting external IT speakers.
    - Sponsor the IT Spotlight Series highlighting internal software and IT projects.

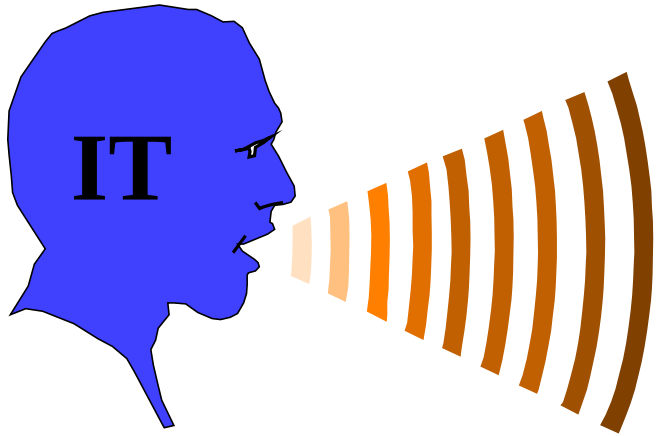


Objectives of CSMISS IT Workforce Enrichment Element (Cont.)

- **Provide career growth and enhancement of technical skills** for IT professionals at JPL.
  - **Provide technical education via ICIS** Information Technology Education and Training (ITET) offering courses in five areas:
    - Information Technology Security
    - Methods, Architecture and Tools
    - Programming and Object-Oriented Technologies
    - Database Tools
    - Core Office Skills (Non-technical IT Skills)
  - **Provide mentoring and consulting in key technical areas.**
  - **Conduct a course on "Understanding Software for Project Managers".**
  - **Develop a Software Architect Program to provide additional training to software engineers to prepare them to contribute at the system level on flight projects.**
  - **Review and make recommendations for software roles on flight projects.**

Objectives of CSMISS IT Workforce Enrichment Element (Cont.)

- **Provide a voice** to address issues of mutual concern to IT Professionals and their managers.
  - **Work with the JPL Human Resources Directorate and IT Managers to address issues of retention, recruiting, training, etc.**
  - **Review and, as appropriate, update the JPL classifications for IT personnel:**
    - Job families, disciplines and sub-disciplines
  - **Represent JPL on the NASA IT Workforce Challenge Team.**



Software Practitioner Concerns

STAAC/AETD Career Development Program

Scott Green / GSFC

May 16, 2000

Background

- In November 1998, an ISC Management Retreat identified the need for ISC career track development
- In June 1999, the Systems, Technology, and Advanced Concepts (STAAC) and Applied Engineering and Technology (AET) directorates initiated the STAAC/AETD Career Development Program
- Existing ISC effort folded into STAAC/AETD effort

Drivers for STAAC/AETD Program

- Respond to GSFC culture survey which indicated the need to address individual development and capitalize on diverse workforce
- Establish mechanisms for developing and maintaining world-class core competencies
- Facilitate the ability of AETD to serve as a workforce feeder to STAAC (and FPPD) by enabling multiple career path options
- Support development of new workforce employees

STAAC/AETD Career Development Program

- Program Development Board (PDB) formed
  - Reps from each AETD Engineering Center
  - Reps from each STAAC Division or Office
  - Rep from Flight Programs and Projects Directorate (FPPD) and Office of Human Resources (OHR)
  - STAAC/AETD Management “Champions”
- PDB focus is on Engineering career path (vs. Resource, Clerical, or Technician)
- Model similar activity completed within FPPD
- Information needs to be accessible via the Internet

Career Development Program Process

- Core group of PDB members, along with support personnel, identified to design program
- Larger PDB to serve as review team
- Employee Test Group identified to provide feedback to core team as needed
- Original goal was to have prototyped system in place by November 1999

Career Development Webpage

Career Development and Planning

Are you interested in creating a personalized career development roadmap or perhaps changing to a different career field? If the answer is "Yes," then read on. This information is for you.

In 1999 Applied Engineering and Technology Directorate (AETD) and the Systems, Technology, And Advanced Concepts Directorate (STAAC) began an effort to create a joint Career Development Program. The objectives are:

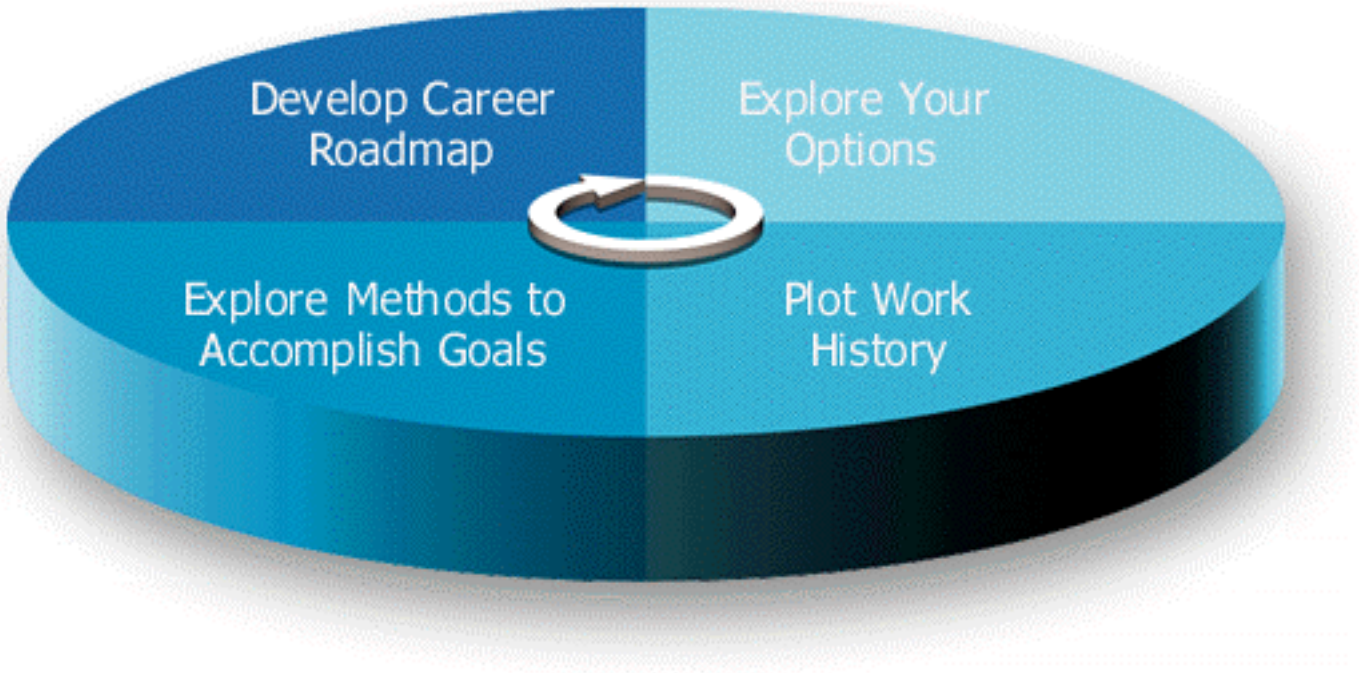
- Address **individual employee** development needs, maximizing the capabilities of our diverse workforce.
- Establish mechanisms for developing and maintaining world-class competencies.
- Train and develop the next generation of technical leaders and project/instrument managers.

Drawing upon the vast resources available on center and in the agency, our strategy is to pull together existing career development programs into a single focus area that is readily accessible as well as provides new career development initiatives where needed. The career planning and development process will assist employees and their supervisors proactively deal with change in the workplace. It is intended to help employees assess their career goals, characteristics, skills, and expertise relative to current and future job requirements.

By participating in this process, employees take responsibility for managing their own careers. Employees focus on developmental activities to acquire new skills thereby improving current work performance and creating opportunity for possible new assignments. As appropriate, supervisors focus on assisting their employees through discussion of current and future job requirements, observed strengths and weaknesses of the employee, and the organizations changing needs.

Follow the PIE icon if you would like to begin the career planning and development process. Select the Tree icon if you would like go directly to constructing your personalized career roadmap.

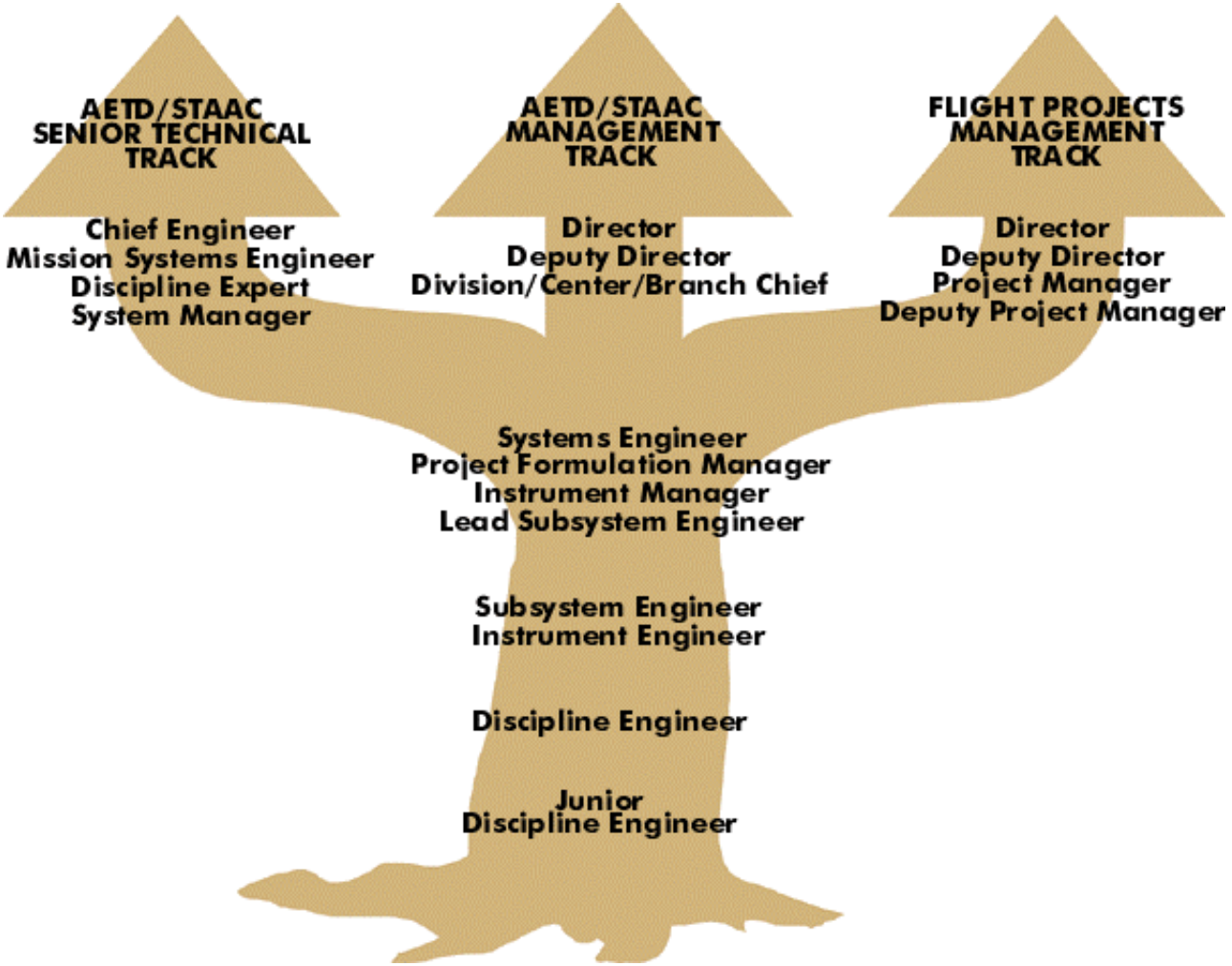
Career Planning Roadmap



Career Planning Activities

- Links provided for each roadmap activity
- Each activity attempts to gather useful pieces of information for personalized career planning
  - Understanding your personal and organization's goals
  - Recording your job experiences
  - Recognizing available options
- Sum of activities provides input to Individual Development Plan (IDP) and follow-on career development discussions

Career Tracks



Career Track Matrices

- Links provided for each job title to two matrices
  - General competencies and skills (across disciplines)
  - Discipline-specific competencies and skills
- Each matrix divided into four components
  - Competency areas (e.g., Organizational Effectiveness, Technical Performance)
  - Knowledge and skills for that area (e.g., Strategic Plans, Engineering Skills)
  - Activities, processes and products (i.e., the details)
  - Training

Sample Matrix

General Discipline Engineer (GS 11-12) Competencies and Skills

Competency Area	Knowledge and Skills	Activities, Processes and Products	Training
Organizational Effectiveness	• Strategic Plans	• Reading Agency, Center and organization strategic plans • Contributing to re dblue team activity as a resource person • Applying NASA Strategic Plan implications to your particular level and position as part of performance plan	•
	• NASA Policies	• Reading NPD 7120.4 and NPG 7120.5A	•
	• NASA Environment	• Observing and contributing to working group meetings	•
Individual and Team Effectiveness	• Interpersonal Communication	• Developing moderate peer intradiscipline and interdiscipline communications skills and peer intradiscipline and interdiscipline team participation skills • Creating and delivering verbal and written personal progress reports	•
	• Program and Project Status Reporting	• Creating and delivering verbal and written project status reports within the engineering center	•
	• Professional Growth	• Reading current technical/management literature in order to keep current in technical discipline and creating a log that catalogs content materials that have been read	•
	• Problem Solving	• Obtaining assignment to and participating in at least one problem-solving team or process-improvement team	•
	• Leadership		
Effective Agency, Business, and International Relations	• GSFC Environment	• Understanding Center organizational structure	•
	• NASA Environment	• Researching and understanding each Center's role and responsibility	•
	• Government Environment		
	• Public Relations		
Project Life Cycle Development and Control	• NASA Project Lifecycle	• Obtaining and reading Agency and Center documents on lifecycle • Observing at least one program review per NASA Project lifecycle phase at Center and/or Directorate level	•

Current Status

- Basic system in place, but additional work still needed on detail pages
- Employee Test Group recently provided feedback
  - Minimal support (5 of 20 people)
  - Most feedback focused on aesthetics vs. content
- Core team progress is steady but slow due to higher priority commitments
- New target is to have prototyped system available by end of FY00

Challenges

- Increased level of commitment
  - Core group
  - Senior management
  - Employee Test Group
- Contractor support to gather detailed matrix inputs
- No motivating feedback available on FPPD model system
- Incorporation of many organizations (5 engineering centers, 5 STAAC divisions) into single career development tool

2nd Annual GSFC-JPL Quality Mission Software Workshop

Software Practitioner Concerns: NASA Software Working Group - Training Subgroup

Quality Assurance Office (506)

Safety and Mission Assurance Directorate

John Kelly

May 16 -18, 2000

NASA Software Working Group (SWG)

- NASA Software Working Group*
  - Has members from NASA centers that are involved in engineering software for space and aeronautics applications
  - The NASA Chief Engineer and the Engineering Management Council charter this group
  - This group is described by the NASA Software Policies document (NPD2820.1)
  - It's role is to advise the Agency on software-related matters and recommend software management, engineering, and assurance policies, standards, best practices, and guidance.

* Note: WebPages: http://www.ivv.nasa.gov/SWG/index.shtml

SWG Subgroups

- **Metrics/Measurement Subgroup** (Chair - T. Hammer, GSFC)
  - NASA Core Metrics for Software
  - NPD 2820.1
- **Standards Subgroup (aka "Team Jack")** (Chair - T. Hammer GSFC)
  - Software Working Group Standards Report
  - Draft NPG outline NPG 2820
- **Training Subgroup** (Chair J. Kelly, JPL, J. Hinkle LaRC/ARC (former Chair))
  - NASA Software Training Course Listing (NASA-TM 209370, Version 2.0), 1999
- **Software Challenges Subgroup** (Chair -- P. Schuler LaRC)
  - Survey & study of NASA's software challenges
- **Best Practices Subgroup** (Chair -- J. Hinkle, LaRC/ARC)
  - Develop and promote a compendium of best practices for software design, production , and maintenance
- **Software Quality Assurance Subgroup** (Chair -- L. Rosenberg, GSFC)
  - Define, baseline, measure, and improve software quality

The SWG Training Subgroup

Product: NASA Software Training Course Listing (NASA-TM 209370, Version 2.0), 73 pages, August 1999*

Subgroup active since 1997

Subgroup Members:

- Carl Daniele (Glenn)
- John Hinkle (ARC/LaRC)
- John Kelly (JPL)
- Pat Schuler (LaRC)
- Martha Wetherholt (Glenn)
- Rose Pajerski (previous member from Goddard)

* Note: Web access for download: http://eis.jpl.nasa.gov/quality/Formal_Methods/nswg.html

Training Subgroup - Objectives

1. **Maintain Agency capabilities in software technology. The NASA work-force will have the necessary skills to effectively manage software projects and apply software technology.**
2. **Increase expertise in NASA software professionals by working with NASA's training office to establish a core set of training requirements for software project managers and software practitioners that support the goals of the NASA Software Strategic Plan.**
3. **Review courses that exist within and outside the Agency, ensure against duplication, and facilitate development of a prioritized set of courses, if no alternative exists.**
4. **Act as interface with other groups providing software training programs within and outside the Agency.**

Training Questions That Needed Answers

- *Where can I find a description of software courses have been developed by NASA?*
- *How do I know if a software course is right for me?*
- *Where are the holes in available courses that should be filled with NASA sponsored course development?*
- *How do I know if a software engineering or management course is available from a non-NASA source in a particular area?*
- *How do I find out if a software training need has a solution that already exists at another NASA center?*

The Training Matrix*

Longer & more involved courses

Three primary categories of intended software audience

4 or less hours

SEI CMM Mapping

SW Subject Area	KPA Level	SW Project Manager		Developer/Engineer		SW Quality Assurance	
		Overview	Practitioner	Overview	Practitioner	Overview	Practitioner
Integrated SW Management	L3	1.2.1 SPMN	1.2.2 SPMN 1.2.5 SPMN	1.2.1 SPMN	1.2.3 SPMN 1.2.4 SPMN	1.2.1 SPMN	1.2.3 SPMN 1.2.4 SPMN
Inter-Group Coordination	L3		2.2.1 SPMN				
Organizational Process Definition/Focus	L3		3.2.1 SPMN 3.4.1 SEI				
SW Acquisition Management		4.2.1 SPMN 4.2.2 SPMN	4.1.1 NASA 4.2.3 SPMN 4.4.1 SEI	4.2.1 SPMN 4.2.2 SPMN		4.2.1 SPMN 4.2.2 SPMN	
SW Configuration Management	L2	5.3.2 STI	5.2.1 SPMN 5.3.1 STI	5.3.2 STI	5.2.1 SPMN 5.3.1 STI	5.1.1 SPMN 5.3.2 STI	5.2.1 SPMN 5.3.1 STI

Comprehensive list of 30 Software Subject Areas

Courses include both NASA and outside organizations

Each course listed has a short description in a separate area of the document

Blanks indicate potential NASA training needs

*Note: NASA Software Training Course Listing (NASA-TM 209370, Version 2.0), Pages 12 - 16

Example: Course Description

7. Software Peer Reviews (L3 KPA)

7.1. NASA

7.1.1. Software Inspections

Instructional Method: Lecture/Workshops

Category: Practitioner

Duration: 1.5 days

Audience: Manager, Developer, Assurance Engineer

Point of Contact: JPL, LaRC, GRC

Description: Software Inspection (developed originally by Michael Fagan, IBM) is a technical evaluation method for finding defects in software products such as requirements, design, code, and tests. The objective of Software Inspections is to increase quality and reduce cost by early detection and removal of defects. This course is taught through the use of lecture material, video example, and hands on exercises where attendees participate as inspectors. The objective of the course is to provide software personnel with the skill to perform effective Software Inspections.

Distribution

- NASA SWG members
- Training Coordinators at the centers
- NASA Headquarters Codes related to software
- Training Suppliers
- Training & Technology Transfer Teams within NASA
- Web availability

Potential Future Directions

- Core curriculum set for NASA managers, software practitioners and SMA (Safety and Mission Assurance) personnel that support the goals of the NASA Software Strategic Plan
- Software training needs analysis
  - List of software areas needing training development
- Work with other organizations to fill and coordinate software training needs:
  - NASA HQ Codes (F, Q, AO, AE, …)
  - Key Organizations at the Centers (Professional Development, …)
  - Other NASA-Wide and Center Specific Training Teams & Groups
  - Outside training suppliers
- Support the other SWG Subgroups to facilitate and coordinate training support for Agency initiatives

Software Practitioner Concerns
NASA IT Workforce Challenge Team

P. A. "Trisha" Jansma

May 16, 2000

NASA IT Workforce Challenge

- By the year 2006, the United States will need 1.3 million new core IT workers.
- As a Federal Agency, NASA must vie with other Federal Agencies, as well as private industry, for these valuable workers in the midst of an IT-driven economy.
- The Clinger-Cohen Act has imposed requirements regarding a CIO's responsibilities to assess the IT skills and knowledge of the Agency's personnel.
- Challenges such as the recruitment, retention and training of skilled IT professionals are issues that must be viewed as problems NASA will face for the long term.

IT WORKFORCE CHALLENGE

NASA IT Workforce Challenge Team

- In May 1999, NASA established an agency-wide IT Workforce Challenge Team as part of a proactive, long-term strategy to develop an integrated training and development program which will enable NASA to meet these long term IT goals.
  - The team is chaired by Dabney Hibbert of the NASA CIO's Office, NASA Code AO.
  - The team has representatives from each NASA Center as well as representatives from the NASA CIO's office and NASA HQ.
  - The team has five committees/subgroups:
    - Recruitment and Retention, IT Training, CIO Development Model, IT Skill Survey, and IT POP Analysis.
  - The team holds weekly one hour telecons to discuss issues of mutual interest, and conducts quarterly workshops:
    - August 10-12, 1999, December 7-9, 1999, March 28-30, 2000

Objectives of First Team Workshop

- To gather information from outside and inside the Agency about IT skills/competencies, IT workforce issues and IT training.
  - e.g., best practices, lessons learned, methodologies, etc.
- To apply this information to:
  - Identify critical issues.
  - Create objectives for identifying and addressing IT skills/competencies, IT training and workforce issues at NASA.

- To identify committees and confirm membership.
- To finalize overall team strategic plan, including action steps/schedule, for NASA CIO Council approval.
- To create action steps and schedules for each committee.

Focus of Second and Third Workshops

- The Second Workshop focused on a summary and discussion of both the qualitative and quantitative data from both interviews and the Directorate surveys conducted in 8/99 and 10/99 regarding IT issues.
  - The discussion included a high level analysis of the potential implications for the Center's IT and HR strategic planning and/or initiatives.
- The Third Workshop focused on a summary and discussion of the identified top 3-4 IT Workforce issues for each Center, and the corresponding strategies, initiatives and plans to address them.
  - It also included reports from the Recruitment and Retention Subgroup and the CIO Competencies Subgroup.

NASA IT Workforce Challenge Team

- Relevant news articles, Web pages and presentations are regularly exchanged to help clarify the scope and nature of the NASA IT Workforce challenge.

- For more information on this team, see the NASA CIO URL:
  - http://www.hq.nasa.gov/office/codea/codeao/workforce.html

IT WORKFORCE CHALLENGE